CHAPTER 1.3

# Waste

# Grade • Subject • Skills Index

| Activity Name | Beware of Mr. Yuk | Trash Art | Weigh Your Waste | Trash Time Travelers | (Hazardous) Waste Not |
|---|---|---|---|---|---|
| **Grade Range** | | | | | |
| K | ✔ | ✔ | | | |
| 1 | ✔ | ✔ | | | |
| 2 | | ✔ | | | |
| 3 | | ✔ | | | |
| 4 | | | ✔ | ✔ | |
| 5 | | | ✔ | ✔ | ✔ |
| 6 | | | ✔ | ✔ | ✔ |
| **Subjects Covered** | | | | | |
| Math | | | ✔ | | |
| Science | | | | | ✔ |
| Language Arts | | | | ✔ | |
| Social Studies | | ✔ | ✔ | ✔ | ✔ |
| Art | ✔ | ✔ | | | |
| Health | ✔ | | | | |
| **Skills Used*** | | | | | |
| Communication | | | | ✔ | |
| Reading | | | | | ✔ |
| Research | | | | ✔ | |
| Computation | | | ✔ | | |
| Observation/ Classification | ✔ | ✔ | ✔ | | ✔ |
| Problem Solving | | | ✔ | | |
| Motor Skills | ✔ | ✔ | | | ✔ |

*See Glossary of Skills for more details.

# Solid Waste

## What Is Solid Waste?

Everyone produces solid waste (otherwise known as trash or garbage), whether it is old newspapers, potato chip bags, shampoo bottles, cut grass, food scraps from the dinner table, old appliances, or even the kitchen sink. Each person in the United States generates 4.4 pounds (EPA, 2003) of solid waste each day, which is often collected by a municipality and is known as **municipal solid waste**. This kind of waste primarily comes from people's homes, but it also comes from some factories, businesses, and schools.

As our population has grown, so has the number of products we use and the total amount of solid waste we generate. Consequently, the composition of garbage continues to change with more plastics, more office paper, and less glass filling up trash cans around the country. The chart below illustrates the different components of municipal solid waste.

## How Do We Manage Solid Waste?

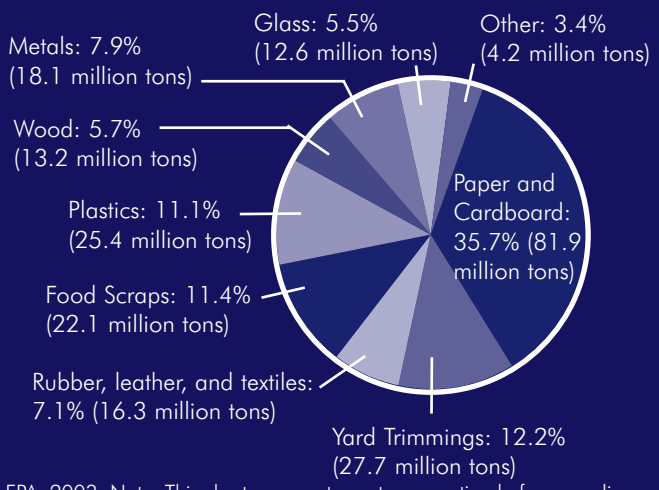
No single method can manage all our nation's garbage. The U.S. Environmental Protection Agency (EPA) recommends the use of a **"waste management hierarchy,"** which ranks methods of waste management in order of preference. Although mentioned briefly here, each method is explained in separate fact sheets. Please refer to these other fact sheets for more information regarding the benefits, challenges, trends, and opportunities of each waste management system. EPA's waste management hierarchy includes:

- *Source Reduction*. **Source reduction**, also known as **waste prevention**, is the preferred method of waste management because the best way to manage garbage is to prevent it in the first place. As the name implies, this method prevents waste at the source by decreasing consumption and reusing products. For example, using a durable cloth lunch bag or reusing the same brown paper bag instead of a new brown paper bag each day prevents waste. It also includes using nonhazardous substitutes as an alternative to toxic products that could end up in the waste stream. For example, using baking soda to clean kitchen and bathroom counters rather than a chemical detergent prevents the disposal of toxins.

### Key Points

- Americans generate about 4.5 pounds of garbage per person each day, which amounts to more than 220 million tons per year.
- EPA advocates a solid waste hierarchy, organizing waste management options in order of preference: source reduction, recycling and composting, and combustion and landfilling.
- Facing a variety of challenges—from rising waste generation rates and costs to closing disposal facilities—community leaders and businesses are devising ways to prevent waste and increase efficiency.

### Municipal Solid Waste Composition




Source: EPA, 2003; Note: This chart represents waste generation before recycling.

## Household Hazardous Waste

Leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients are considered **"household hazardous waste."** Examples of products that could become household hazardous waste include certain cleaning products, pesticides, motor oil, oil paints, adhesives, and batteries.

Unlike municipal solid waste, special care must be taken in disposing of household hazardous waste to minimize the impact on human health and the environment.

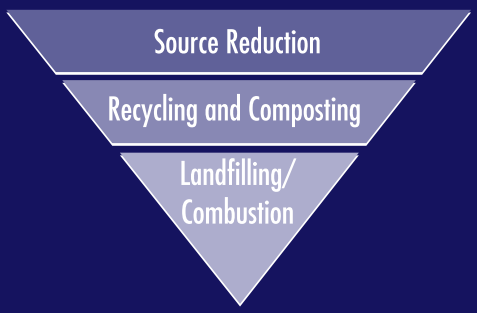
The best ways to reduce the amount of household hazardous waste being disposed of are to use up all of the products or share them with someone else until they are used up or properly recycle them.

If you are unsure of what to do with these products, contact your local environmental or solid waste agency.

• *Recycling, including Composting.* If waste cannot be prevented, the next best way to reduce the volume of it that must be disposed is to recycle or compost it. **Recycling** refers to a series of activities where discarded materials are collected, sorted, processed, converted into raw materials, and used to make new products. **Composting** is the decomposition of organic materials such as yard trimmings and food scraps by microorganisms. The byproduct of this process is compost—a soil-like material rich in nitrogen and carbon that can be used as a plant fertilizer supplement. Both of these processes use waste as a raw material to create new and valuable products.

• *Disposal: Combustion and Landfills.* Trash that cannot be reduced, recycled, or composted must be disposed of. **Combustion** is the burning of waste in specially designed facilities often called incinerators. It reduces the bulk of waste, and some facilities provide the added benefit of energy recovery (**"waste-to-energy" facilities**). **Landfills** are also major components of waste management. A landfill is a large area of land or an excavated site that receives waste. Combustion facilities and landfills are subject to environmental controls that require them to be properly maintained so there is no waste run-off that might contaminate drinking water supplies. The portion of waste requiring combustion and land disposal can be significantly reduced by reducing, reusing, or recycling—the "3 Rs" of solid waste management.

## Solid Waste Hierarchy




## What Are the Benefits of Waste Management?

It might seem hard to believe now, but people once dumped trash out windows onto the streets, left it in local ravines or quarries, or burned it in fields and open dumps. In fact, throughout time, people have made garbage "go away" in different ways, regardless of environmental or aesthetic impacts. As one can imagine, these activities created serious sanitation problems for a community. Open dumps produced noxious odors, attracted rodents and pests that spread disease, and polluted drinking water supplies.

Federal, state, and local laws now control how solid waste is managed and disposed of. These regulations set standards for trash disposal. As a result of regulations, many communities have state-of-the-art landfills and combustion facilities that minimize ground- and surface-water contamination and air pollution. At the same time,

they provide a safe and convenient way to remove trash from homes and neighborhoods.

Waste management can also create jobs and provide an economic boost to some cities and counties. Whether workers are collecting garbage, constructing disposal facilities, managing recycling programs, or developing new technologies, the waste management industry employs hundreds of thousands of people nationwide.

## What Are the Challenges of Solid Waste Management?

Despite the improvements that have been made to solid waste landfills and combustion facilities over the years, the general public still does not want to live near a disposal facility. With varying public opinion and the Not in My Backyard (NIMBY) mentality, community leaders often find it difficult to find new sites for waste management facilities.

Balancing all of the management options in the solid waste hierarchy can be a major challenge. Many communities have invested resources in source reduction and recycling in an effort to reduce the amount of trash that must be landfilled or combusted. Yet reducing waste ultimately involves changing behaviors—purchasing environmentally friendly products when possible, and participating in recycling and composting programs.

### HHW Facts

- The average home may have up to 100 pounds of household hazardous waste stored throughout the house.
- Americans generate 1.6 million tons of household hazardous waste each year.

## What Are Some Emerging Trends?

Communities continue to seek ways to reduce waste. One recent trend is to charge residents for garbage collection services based on the amount of trash they throw away, known as "Pay-As-You-Throw" (PAYT). By paying for garbage services in the same way as electricity, water, and other utilities, residents have a direct incentive to reduce the amount of trash they generate and to recycle more.

**Additional Information Resources:**

Visit the following Web sites for more information on municipal solid waste:

- U.S. Environmental Protection Agency (EPA): <www.epa.gov>
- U.S. EPA Office of Solid Waste site on municipal solid waste: <www.epa.gov/epaoswer/non-hw/muncpl/facts.htm>
- U.S. EPA Office of Solid Waste publications on household hazardous waste: <www.epa.gov/epaoswer/non-hw/muncpl/hhwpubs.htm>

To order the following additional documents on municipal solid waste, call EPA toll-free at (800) 490-9198 or look on the EPA Web site <www.epa.gov/epaoswer/osw/publicat.htm>.

- *Characterization of Municipal Solid Waste in the United States*
- *Sites for our Solid Waste: A Guidebook for Public Involvement* (EPA530-SW-90-019)
- *A Collection of Solid Waste Resources* on CD-ROM

# Hazardous Waste

## What Is Hazardous Waste?

Many of the appliances, products, and materials used in everyday life are manufactured using processes that create **hazardous waste**. From the paint on your walls, to the components of your car, to the shingles on your house, it is likely that when these products were made, some hazardous waste was generated. Hazardous wastes are substances that exhibit one or more of the following characteristics:

- **Toxicity**—harmful or fatal when ingested or absorbed.
- **Ignitability**—creates fire under certain conditions or spontaneously combusts.
- **Corrosivity**—contains acids or bases that can corrode metal.
- **Reactivity**—is unstable under "normal" conditions and can cause explosions, toxic fumes, or vapors when mixed with water.

Hazardous waste is created by a variety of different industries, such as petroleum refining and pesticide, chemical, ink, paint, and paper manufacturing. It also is created by the activities of certain smaller businesses found in many communities, such as dry cleaners, vehicle maintenance shops, vocational schools, and photoprocessing stores. In addition, hazardous waste is created when businesses or facilities dispose of certain unused products.

Hazardous waste is an inevitable product of a thriving industrial society. It is important to be aware that the choices consumers make when selecting products, services, and materials have hidden environmental effects. Consumers also should realize that the management of hazardous waste is regulated by law and that facilities that produce, transport, or dispose of it must follow very specific rules to minimize environmental and human health problems. The primary law that governs the proper management of hazardous waste is known as the **Resource Conversation and Recovery Act (RCRA)**.

### Key Points

- Hazardous waste can be produced in the manufacturing process of many common products people use every day, as well as many common services.
- To protect human health and the environment, hazardous waste is regulated from the time it is produced to the time it is disposed of.

## How Do We Manage Hazardous Waste?

The RCRA regulations cover all aspects of hazardous waste—from the time it is generated at a factory or plant until the time it is discarded. This is known as ***"cradle to grave."*** This regulatory system includes many detailed rules that require hazardous waste to be tracked as it

## "Hazardous Waste" Versus "Household Hazardous Waste"

**"Hazardous waste"** is regulated by EPA. Businesses, institutions, or other facilities (sometimes including schools) that generate it must comply with certain rules regarding generation, management, transportation, and disposal.

When individuals dispose of household products from their home that contain hazardous ingredients, such as pesticides, cleaners, batteries, or used oil, they create what is known as **household hazardous waste**. Individuals usually produce much less hazardous waste than businesses and other facilities, and they are not regulated by EPA. Even so, many communities require or prefer that household hazardous waste is handled separately from the regular garbage to prevent any potential risks to the environment or human health.

When disposing of household hazardous waste from your home, remember the following:

- Sharing leftover household products is a great way for people to use all of a product and avoid disposal. If you cannot share or donate leftover products, check with your local environmental or solid waste agency to see if your community has a facility that collects household hazardous wastes year-round or offers opportunities for exchanging products with other residents.
- If your community doesn't have a collection program for household hazardous waste, contact your local environmental or solid waste agency to see if there are any designated days in your area for collecting these materials. On such days, qualified professionals collect household hazardous waste at a central location to ensure safe management and disposal.
- If your community has neither a permanent collection site nor a special collection day, you might be able to drop off certain products, such as batteries, paint, or automotive supplies, at local businesses for recycling or proper disposal. Call your local environmental or solid waste agency or Chamber of Commerce for information.
- Some communities allow disposal of household hazardous waste in trash as a last resort. Call your local environmental or solid waste agency for instructions on proper disposal. Be sure to read the product label for disposal directions to reduce the risk of products exploding, igniting, leaking, mixing with other chemicals, or posing other hazards on the way to a disposal facility. Even empty containers of household hazardous waste can pose hazards due to residue.

moves from place to place; one of the rules requires the use of a tracking paper known as a "manifest." This paper must travel with the waste wherever it goes (e.g., wherever it is stored, shipped, recycled, or disposed of).

Depending on how much waste a facility generates, it is regulated differently; bigger facilities that produce a large amount of hazardous waste each month have more rules than those that produce a small amount of waste.

After a company or factory generates hazardous waste, the waste must be packaged and labeled in special containers, and it must be transported by a regulated hazardous transportation company in special packages with specific labels. These trucks often can be identified on the highway by multicolored placards and symbols that indicate the type of hazardous waste they carry. The Department of Transportation is responsible for regulating these trucks.

Hazardous waste is usually transported to a facility that treats, stores, and/or disposes of it. Most hazardous waste must be specially treated with certain processes to alter its hazardous composition before it can safely be recovered, reused, or disposed of. Sometimes waste is stored temporarily in a regulated unit. When the waste is

ultimately disposed of, it is transported either to a landfill or special combustion facility (see Teacher Fact Sheets titled *Landfills* on page 165 and *Combustion* on page 169). Combustion facilities must take special precautions to prevent air pollution, and they must ensure that only appropriate wastes are burned.

Sometimes hazardous waste is transported to a facility that recycles hazardous waste. Certain hazardous wastes can be recycled and used again. For example, many solvents can be recovered, some metals can be reclaimed, and certain fuels can be re-blended. Hazardous waste recycling is regulated under RCRA to ensure the protection of human health and the environment.

To keep track of all of the facilities that treat, store, or dispose of hazardous waste and ensure that they follow the rules, EPA and many states have a permitting system. Each company must obtain a permit, which tells companies what they are allowed and not allowed to do. Inspectors check these facilities regularly by reviewing company records, observing operating procedures, and sometimes collecting hazardous waste samples. For further tracking purposes, EPA also requires all companies that generate hazardous waste to register and obtain an EPA identification number.

## What Are the Benefits of Hazardous Waste Management?

Before RCRA took effect in 1970, companies could—and did—dispose of hazardous waste in rivers, streams, and other inappropriate places. By enforcing strict rules about the way waste is handled, EPA and other agencies can better control the effects of hazardous waste on the environment and human health. These controls, while not always perfect, allow the industrial production on which we all depend to continue in as safe a manner as possible.

In addition, EPA has made waste minimization practices and pollution prevention activities key requirements for companies that produce hazardous waste. Any company that creates a certain amount of hazardous waste each month must sign a statement indicating that it has a program in place to reduce both the amount and toxicity of its hazardous waste. These companies also must indicate that they have chosen a method of hazardous waste treatment, storage, or disposal that minimizes the present and future threat to human health and the environment.

It can be difficult for individuals to identify companies that have taken substantial measures to minimize hazardous waste and prevent pollution, and thus, it is not always possible to lend support for these activities by patronizing those companies. When information of this sort is available, however, consumer demand can make a difference.

### Hazardous Waste Facts

- In 2001, companies produced 40.8 million tons of hazardous waste.
- Nearly 20,000 large facilities generated hazardous waste in 2001.
- Many hazardous wastes can be generated in schools, such as solvents from cleaning, chemicals from chemistry labs, fluorescent light bulbs, computer monitors, and chemical residues from woodshops.

(Source: EPA National Biennial RCRA Hazardous Waste Report [2001 Data])


## What Are the Challenges of Hazardous Waste Management?

Just as people and communities generally do not want municipal solid waste facilities in their neighborhoods, they often do not want hazardous waste facilities near their homes and schools (the NIMBY mentality). When new hazardous waste generation or treatment facilities are sited near communities, the public can become involved in the process, but it can be a challenge for companies and communities to achieve mutually acceptable solutions.

The RCRA regulations allow the public to have an opportunity to participate in decisions about hazardous waste management. Through public meetings and other open forums, people can express their concerns about a new facility.

**Additional Information Resources:**

Visit the following Web sites for more information on hazardous waste:

- U.S. Environmental Protection Agency (EPA): <www.epa.gov>
- U.S. EPA Office of Solid Waste site on hazardous waste: <www.epa.gov/epaoswer/osw/hazwaste.htm>

To order the following additional documents on hazardous waste, call EPA toll-free at (800) 490-9198 or look on the EPA Web site <www.epa.gov/epaoswer/osw/publicat.htm>.

- *The RCRA Public Participation Manual* (EPA530-R-96-007)
- *RCRA Orientation Manual: 1998 Edition* (EPA530-R-98-004)
- *RCRA: Reducing Risk From Waste* (EPA530-K-97-004)

art

health

# Beware of Mr. Yuk!

## Objective

To teach students to recognize the "Mr. Yuk" symbol; to help students understand that this symbol designates hazardous household products that should not be handled by children without adult supervision and without reading labels properly.

## Activity Description

Students will identify Mr. Yuk stickers in the hidden picture and color them in bright green to signify hazard/poison.

## Materials Needed

- One copy of the *Beware of Mr. Yuk* worksheet per student
- One red or green crayon for each student (Preferably from the fluorescent color box)

## Key Vocabulary Words

Product
Poison
Danger

## Duration

30 minutes

## Skills Used

Observation/classification
Motor skills

## Activity

**Step 1:** Put an enlarged picture of Mr. Yuk on the blackboard and ask students if they've seen it before. Elicit from students how they would describe Mr. Yuk.

**Step 2:** Tell the students they will be given a drawing of a house. In the picture are many products commonly found in homes, and they will have to find the ones with a Mr. Yuk face on them. Explain that if they were to find a real product in their real home with a Mr. Yuk face on it, they should not touch it; they should tell an adult about it. Ask them where Mr. Yuk products are sometimes located in a home (e.g., kitchen, bathroom, garage).

**Step 3:** Distribute crayons and worksheets to students and ask them to color only the Mr. Yuk stickers on the products they see. Students can work individually or in groups.

**Step 4:** After coloring the Mr. Yuk stickers, students can color the entire scene.

**Mr. Yuk Stickers**

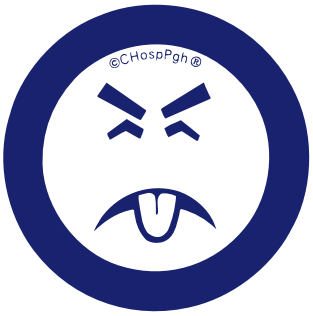
Teachers who wish to promote the use of Mr. Yuk stickers at home could consider sending a note to parents indicating where stickers can be obtained. Most local poison control centers have Mr. Yuk stickers available.

## Assessment

1. Collect the *Beware of Mr. Yuk* worksheets and assess whether students correctly identified products labeled with Mr. Yuk.
2. Ask students what they would do if they found a Mr. Yuk sticker in their homes.
3. Ask students why certain products get labeled with Mr. Yuk stickers.

## Enrichment

1. Conduct a role-playing game by putting a Mr. Yuk sticker on an empty product container and asking students to pretend they come upon it in their homes. Have one or more students pretend that they are parents and are telling the "kids" about the Mr. Yuk sticker and its importance.
2. Ask students to draw places in their homes where Mr. Yuk products might be found (kitchen, bathroom, garage, etc.)

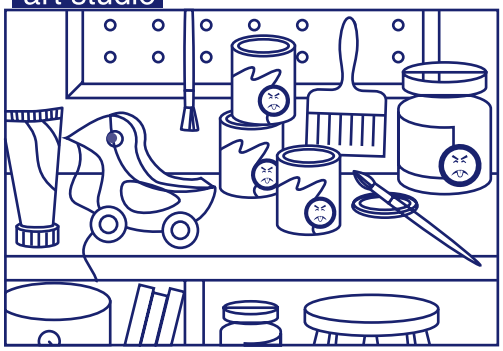


# Beware of Mr. Yuk

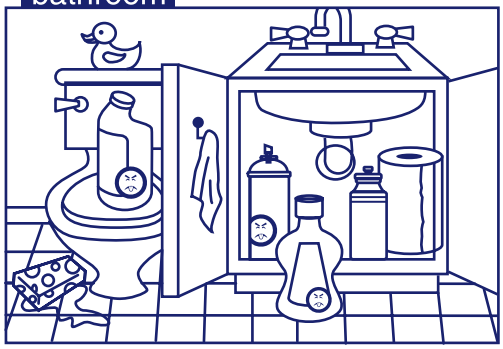


**Name:**

art studio

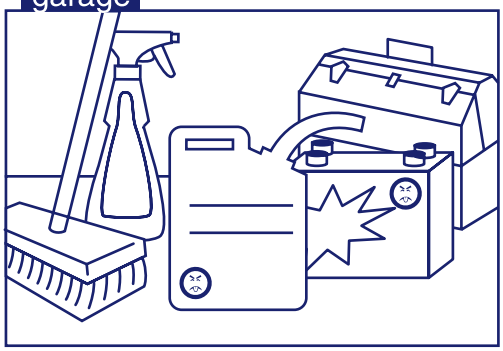


bathroom



kitchen

garage



basement

# Trash Art

social studies

art

## Objective

To encourage students to think about what kinds of materials they throw away.

## Activity Description

Students will create a trash mural from collected pieces of home garbage and images of disposable items from magazines.

## Materials Needed

- One copy of Parents' Note for each student
- One tarp or drop cloth
- 10 to 12 magazines (with lots of everyday product advertisements)
- "Clean" garbage (brought in by students)
- Art supplies (enough for class):
  - Three to four sheets of colored construction paper per student
  - Glue
  - Tape
  - Scissors
  - Markers or crayons
  - Glitter

## Key Vocabulary Words

Waste
Product

## Duration

1 hour

## Skills Used

Observation/classification
Motor skills

## Activity

**Step 1:** Photocopy and send students home with the Parents' Note, which asks them to help the students collect two pieces of "clean" garbage for class the next day.

**Step 2:** Lead students in a discussion of what garbage is and where it comes from. Ask them if they know how to identify garbage.

**Step 3:** Lay a tarp on the floor and have the students sit in a circle around it. Ask them to spread out their pieces of garbage on the tarp. Go around the room and ask each student to describe what kind of garbage they brought in. Explore how students knew the item was garbage and what its purpose was before it became garbage. Encourage the students to compare and contrast the shapes, colors, and sizes of the garbage on the tarp.

**Step 4:** Divide the class into pairs and distribute a magazine and scissors to each pair (teachers should use their judgement about the use of scissors for younger students). Tell the stu-

dents to look for pictures of objects or products that are only used once and then thrown away. Ask the students to cut out as many of these objects as they can. Go around the room to discuss what pictures were chosen and why.

**Step 5:** Distribute the rest of the art supplies. The art exercise for this activity can be conducted in many different ways; below are a few age-specific suggestions:

**For younger students:**

- Instruct students to use their magazine pictures and trash objects to make a collage by gluing them onto the construction paper. Help all of the students tape their construction paper up on the classroom wall to form a colorful trash mural.
- Have students organize their trash in terms of color or size. Help students decide where each piece of garbage should go on the mural so that alike items are grouped together.

**For older students:**

- Have students make a trash rainbow by organizing the trash into rainbow colors. Students could draw the outline of the rainbow on the paper first, then paste their trash in the appropriate color band on the mural.
- Have students design a 3-D trash sculpture. Ask them to think about the color and shape of each trash item before gluing it onto the sculpture.
- Have students organize the trash by the purpose it had during its useful life. For example: was it a product or packaging for a product? A cleaning product, food product, or hair product? Ask students to write down category names on the mural and then paste their trash in the appropriate spot.


1. Ask students to name three different items that they or their family members often throw away.
2. Have the students guess how many pieces of trash are on the class trash mural. Discuss with students that the mural is just a small amount of what gets thrown away every day in the world.
3. Ask students what purpose the trash served during its useful life. Ask them what it was before it became trash.


1. Conduct a followup activity on what happens to garbage after it's thrown in the trash can. This resource offers the following activities: *Luscious Layered Landfill* on page 173 (for younger students) or *A Landfill Is No Dump!* on page 177 (for older students).
2. Take a field trip to a waste disposal site (a landfill or incinerator) to find out where waste goes. See the Teacher Fact Sheets titled *Landfills* on page 165 and *Combustion* on page 169 for background information.
3. For grades 2-3, enrich the activities by doing the following:

- After students have brought in pieces of trash, ask them to separate the items into the following categories: paper, metal, food, glass, plastic. Discuss whether these items need to be thrown away or whether they can be reused or recycled.
- Have students determine how much of each category of trash items they have collected. Draw a trash can on the chalkboard and have students come up and use a different color piece of chalk to make hash marks (in the "trash can") for each type of trash item collected.

## Parents' Note


Dear Parent,

Tomorrow we are undertaking an environmental education activity to learn more about how much garbage we create and what we do with it. I have asked each student to bring in two pieces of "clean" garbage for our trash mural. In the interest of safety and sanitation, I would appreciate your assistance in helping your child pick out two garbage items that are manageable in size and "clean" (no glass, jagged metal, food, or wet items). Good examples of "clean" garbage include: a cereal box, empty soda can, paper, plastic bag, wrapping, packaging, plastic juice bottle, etc.

Thanks for your help!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Thanks for your help!

# Weigh Your Waste!

math

social studies

## Objective

To increase students' awareness of the amount of waste they generate and the implication of that waste.

## Key Vocabulary Words

Waste
Per capita

## Activity Description

Students will collect, weigh, record, and analyze the amount of trash they generate in the course of a week.

## Duration

1 to 2 hours, with periodic discussions over the course of a week

## Materials Needed

- One trash bag per student
- One twist tie garbage bag fastener for each student
- One 3- by 5-inch note card per student
- One plastic tarp
- One set of gloves per student
- One scale
- One copy of *My Trash Journal* for each student
- Clear tape

## Skills Used

Computation
Observation/classification
Problem solving

## Activity

**Step 1:** Photocopy and distribute copies of the *My Trash Journal* worksheet to each student. Refer to the Teacher Fact Sheet titled *Wastes* for background information.

**Step 2:** Distribute one garbage bag, one twist tie, and one note card to each student. Tell students to take the trash bag to classes for 1 week (5 days), using it to collect all of the "dry" garbage they throw away at school. Instruct students to include all of their used containers, paper waste, and packaging, but **not** to include food waste or any other type of "wet" trash that might decompose or be unsanitary. For safety reasons, instruct students not to collect glass items either.

**Step 3:** Have the students put their names on the note cards and tape them to the twist ties (or use a hole-punch). Then have students use the twist ties to close their garbage bags. Explain that at the end of each day, students will bring their garbage bags back to the classroom and store them overnight in a designated spot (show them the location). The name tags will allow them to pick out their trash bag the next morning.

**Step 4:** At the end of the week, ask the students to predict how much their individual piles weigh. Ask them to predict how much the total pile of garbage for the whole class would weigh. Write some of these predictions on the board.

## Journal Activity

Have students write a commercial "jingle" asking people to reduce the amount of waste they generate.

**Step 5:** Bring in a tarp and spread it on the floor. Have each student spread the contents of his or her personal trash bag on the tarp. Have the students put on gloves and sort their individual piles of garbage into as many categories as possible: plastics, aluminum, paper, steel, and mixed materials (those that fit into more than one category). Have them record the contents of their garbage piles using the *My Trash Journal* worksheet.

**Step 6:** Have students weigh their individual piles of garbage on a scale and record the amounts on the chalkboard.

**Step 7:** Ask a student to total the weights of each individual pile of garbage and put this number on the chalkboard. Determine the average weight of trash generated per student per day. Compare these weights to the students' predictions.

**Step 8:** Write the national average of waste generation on the board: 4.3 pounds per person per day.

Ask the students to determine the following:

- How much waste did the class generate per day on average? Is this higher or lower than the national average?
- If each person in your community (population_____) throws away ___ pounds (use the students' average calculated above) of garbage each day, how many total pounds of garbage are thrown away each day in your community?
- How many tons is this? (To help children grasp the concept of a ton [2,000 pounds] you might want to ask them how many tons some familiar objects weigh, for example, an average 4-door compact car weighs about a ton.)

## Assessment

1. Ask the students why they think they generate so much trash. Is it more or less than they anticipated?
2. Ask the students if they were surprised at how much trash they generated. Where does all of this waste go every day? (See the Teacher Fact Sheet titled *Landfills* on page 165 for background information.) Why should we care how much we throw away?
3. Ask students to look at their waste generation charts and think of ways they could have reduced the amount of garbage generated this week. (Could any items have been recycled or reused? What about using less in the first place? For example, bringing a reusable cloth lunch bag instead of a paper lunch bag each day.) Refer to the Teacher Fact Sheets titled *Source Reduction* on page 79, *Recycling* on page 101, and *Composting* on page 141 for background information.

## Enrichment

1. Have students identify the categories of materials they generally throw away or recycle. Make a list of common items on the board (recyclable and nonrecyclable). Ask students how much less waste they would have generated if they recycled instead of discarded all of the recyclable materials they used this week.
2. Have a student contact your state or municipal solid waste manager to find out about your community's trash generation rate. How does it compare to other communities in your county or state? Discuss the results and reasons behind them with your students.
3. Have students record the amount of waste their families generate at home in 1 week (a note to parents explaining the assignment might help). Suggest students weigh each bag of trash generated on a bathroom scale.

Students should keep a log of these weights. At the end of the week, have students compare their data with classmates.

4. Either in class or as a homework assignment, ask the students to create graphs and charts of their data from class and home waste generation. The graphs might include:

   - A pie chart of the number of pounds for each material measured for each individual.
   - After pairing up with a partner and comparing notes, a bar graph of the number of pounds of each material for the two students.
   - A bar graph and/or pie chart showing the amount of total materials collected that were recyclable versus not recyclable in your community.

   Discuss with students which materials were generated more than others and whether more recyclable or nonrecyclable materials were generated.

5. Take a field trip to a landfill or combustion facility so students can see what happens to their trash.

6. Partner with a local business to calculate how much waste the company generates in a given day by conducting an audit of the paper waste (or other dry waste) generated.

7. Get permission for your class to sort through the school dumpster on a given day (with appropriate safety equipment such as gloves and goggles) to weigh its amount and determine how much useful or recyclable material is thrown out.

# My Trash Journal

**Name:** _____

| What Did I Throw Away? | What Material Category Does it Belong In? *(Paper, Glass, Aluminum, Steel, Plastic)* | My Ideas for Using Less, Reusing, or Recycling this Item |
|---|---|---|
| Example:<br>1 soda bottle | Glass | I could recycle this in bins outside my school. |
| Example:<br>5 lunch bags | Paper | I could use a cloth lunch bag each day instead of using paper. |
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| | |
|---|---|
| **Total weight of my garbage for one week =** [calculated in class] | |
| **Weight of recyclables =** [calculated in class] | **Weight of nonrecyclables =** [calculated in class] |
| **Total weight of my garbage per day =** [calculated in class] | |
| **Total weight of class garbage for one week =** [calculated in class] | |
| **Average amount of waste generated per student per day in our class =** [calculated in class] | |

# Trash Time Travelers

language arts

social studies

## Objective

To teach students how lifestyles change over time and how these changes alter the production and management of waste.

## Activity Description

Students will interview adults, either at home or in the community, to find out what people considered trash years ago and how that trash was handled.

## Materials Needed

- One copy of the *Rubbish Reporter* worksheet per student
- Brightly colored markers (one per student)
- One ball of string or twine
- One hole-punch
- One roll of masking tape

## Key Vocabulary Words

Landfill
Recycle
Reuse
Combustion

(this list will vary for each student's interview)

## Duration

2 hours over two class periods

## Skills Used

Communication
Research

## Activity

**Step 1:** Photocopy and distribute the *Rubbish Reporter* worksheets to each student. Conduct an introductory discussion touching on the following topics (refer to the Teacher Fact Sheet titled *Solid Waste* on page 47 for background information):

- Discuss what the common components of our trash are today—list them on the board.
- Ask students to think about how this list might differ from the trash list of a settler in colonial times, a farmer during the Great Depression, or a grandparent who lived through World War II.
- Discuss how trash is disposed of today and ask students how they think people of other time periods disposed of trash.

**Step 2:** Inform students that they are now "Rubbish Reporters." Their assignment is to write a story about how different lifestyles in different historical periods affected the generation and handling of trash.

**Step 3:** Have students take the *Rubbish Reporter* worksheet home and use it to interview at least two elderly family or community members. Give students 2 or 3 days to complete this assignment.

**Step 4:** Have students bring in their completed *Rubbish Reporter* worksheets and pick one of their interviewees to focus on. As an in-class assignment, have the students use their completed worksheets to write a short paragraph or "article" about what their interviewee thought of "trash," how they disposed of trash, and how those ideas and practices might differ from ours today. Instruct students to mark

## Journal Activity

Ask students to pretend that they are each of the following characters: a pilgrim living in the 1500s, a professional (business person) living in the city today, and a grizzly bear living today in Yellowstone National Park. Have students write about what kinds of trash they generate as each of these characters. Ask them which character they think is most wasteful and why.

(in the left-hand corner of the page) the year (or years) that their interviewee remembered or referred to during the interview.

**Step 5:** Go around the room and have each student stand up and read his or her article out loud to the class. Discuss the issues, such as time period, geographical location, trash disposal, and recycling, that are raised in each article.

**Step 6:** After discussing each article, have the students determine its one aspect of trash disposal or management that is most unique. (*For example, someone may have saved all metal for recycling during WW II or burned his/her own trash on a farm each day, etc.*) Have the student write this one aspect with a colored marker at the top of his/her article.

**Step 7:** Collect all of the articles and spread them out on the floor. Have the students help you organize them in a time line according to the years marked in the upper left-hand corner of the pages.

**Step 8:** Using the hole-punch, put holes in the tops of each article and connect them using the string. Hang your "Trash Time line" somewhere in the classroom or school.

## Assessment

1. Collect all of the students' *Rubbish Reporter* worksheets and articles and evaluate them for completeness, comprehension, and content.
2. Ask students to offer an explanation of why trash and its management differs for each generation. Ask them to predict what trash will be like in the future and what people will do with trash 100 years from now.
3. Have students list four ways in which trash management in the past differs from trash management today.

## Enrichment

1. If there are one or two very interesting or unique trash stories that students bring in, ask those interviewees to come in and speak to the class more extensively about their recollections. Have students prepare questions in advance to ask the guest speaker.
2. Using the different time periods or locations that surface during the students' interviews, pick one or two for an in-depth history and social studies lesson. Have students explore the setting of the time period, learn about the political and social events of that time, and investigate how these might have affected trash and its disposal.

# The Rubbish Reporter

**Name:** _____

General Assignment: Ask your interviewee to pick a time in his/her past that is easy to recall in detail. Ask the interviewee to remember what he/she considered trash at that time (what was thrown out), how that trash was disposed of, where it was disposed of, and how all of these characteristics compare with today's ideas about trash and methods for handling trash.

**Rubbish Reporter's name:**

_____

**Interviewee's name:**

_____

**What time period(s) does your interview cover?**

_____

**What geographical location?**

_____


## Interview Questions

**1.** What time period are you going to talk about? How old were you then? What was your occupation (if you were old enough)?

**2.** What were the most important political and social events during the time period you are remembering?

**3.** What did you consider trash when you were younger? What kinds of things did you throw out?

**4.** How was your trash handled? Was it picked up, sent to a landfill, burned? Who provided this service?

_____

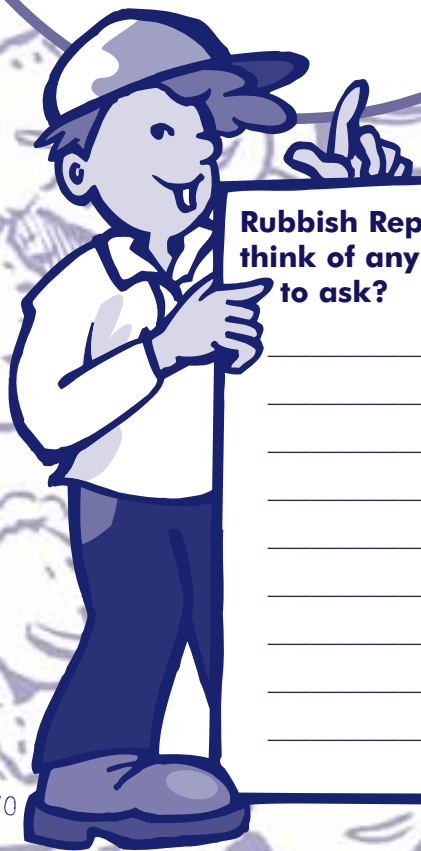
## Interview Questions *(continued)*

**5.** Did you reuse or repair items? What kinds of items did you reuse? Did you recycle? What did you recycle? What were recyclables made into or used for?

**6.** Name some products that you use today that were not available to you then.

**7.** What were many of your products (such as toys, food containers, or appliances) made of during this time period? Did you have a lot of plastic products? Glass? Metal? How were they packaged?

**8.** What was your attitude toward trash then? Has it changed now?



**Rubbish Reporter: Can you think of any more questions to ask?**

**9.** Do you think we are more wasteful as a society today?

# (Hazardous) Waste Not

Social Studies

Science

## Objective

To show students what could happen to ground water if hazardous waste were not regulated.

## Activity Description

Students will create an aquifer and demonstrate how hazardous waste could seep into ground water.

## Materials Needed

- Clear plastic cup for each student
- *What's Going on Underground* diagram for each student
- Molding clay (enough for each student to have a ½-inch by ½-inch square)
- One-quart container filled with sand
- Container of small pebbles (enough for a ½ cup for each student)
- Bucket of water and ladle
- Red food coloring

## Key Vocabulary Words

Aquifer
Hazardous waste
Byproduct
Regulation
Ground water
Saturated zone
Porous
Water table
Surface water

## Duration

1 hour

## Skills Used

Reading
Observation/classification
Motor skills

## Activity

**Step 1:** Discuss with the class how ground water is a major source of drinking water for as much as half of the U.S. population. Provide each student with the *What's Going on Underground* diagram and discuss how ground water forms, exists, and can be extracted. Review the vocabulary words and definitions provided on the diagram. Explain that it would be very easy to contaminate ground water if hazardous waste were simply dumped on the ground and absorbed by the soil. Define and discuss hazardous waste. (Refer to the Teacher Fact Sheet titled *Hazardous Waste* on page 51 for background information.)

**Step 2:** Place the containers of pebbles, sand, and bucket of water with the ladle on a table in the classroom where each student can access them.

**Step 3:** Pass out a plastic cup to each student. Ask the students to fill their cups half full

### RCRA and Hazardous Waste

In 1976, Congress passed the Resource Conservation and Recovery Act (RCRA) to protect human health and the environment from the potential hazards of waste disposal. RCRA establishes a regulatory system for managing hazardous waste from generation until ultimate disposal ("cradle to grave").

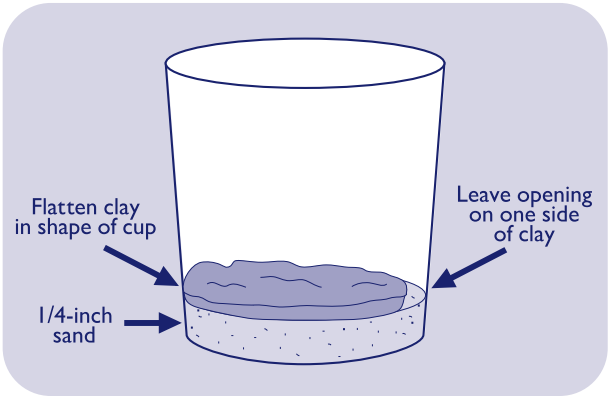
## Journal Activity

Ask students to prepare questions and answers representing an interview with an animal, tree, flower, or other member of nature. Students should think about how elements in nature would "feel" about hazardous waste contamination in the environment. Have them pretend they are reporters trying to discover how hazardous waste can affect the natural environment.

of small pebbles. In addition, give each student a ½-inch by ½-inch piece of the molding clay. Ask the students to dump the pebbles on their desk and keep them there temporarily.

**Step 4:** Ask each student to go to the sand container and scoop enough so that there is about 1/4-inch on the bottom of their cups. After they add the sand, ask them to ladle just enough water into the cup so that it is absorbed by the sand. Discuss how the water is still in the cup, but that it is being stored in the "ground."

**Step 5:** Have each student flatten their clay in the shape of the cup bottom and then place it over the sand. Fasten the clay to one side of the cup, but leave an opening on the other side.




**Step 6:** Ask each student to place their pile of pebbles into the cup, on top of the clay. They can place the pebbles so that they lay flat or form hills and valleys.

**Step 7:** Ask the students to add a ladle full of water to their "aquifers." Students that formed hills and valleys with their pebbles will see that they have surface water in addition to ground water, depending on how much water they added to their cups. Discuss how both surface and ground water can be sources of drinking water and that some parts of the ground are more porous than others (e.g., water slips more easily through the pebbles than the clay).

### Ground Water Contamination

Ground water contamination can occur when liquids (usually rainwater) move through waste disposal sites, carrying pollutants with them, and into the ground water. RCRA regulations require ground water monitoring, which detects early signs of contaminants leaching from hazardous waste facilities.

**Step 8:** Tell the students to imagine that there is a factory that produces "widgets" near their aquifer. In the course of producing widgets, the factory produces a hazardous waste byproduct. Ask students to imagine that hazardous waste regulations do not exist and that the factory is allowed to dump its hazardous waste on the ground outside, which is also an aquifer.

**Step 9:** Pass the food coloring around the room so that each student can add a few drops to their aquifers. Explain that the food coloring represents hazardous waste that is being dumped illegally. Ask the students to watch the path of the food coloring.

**Step 10:** Discuss how easy it is to pollute and contaminate the ground water. Explain that this is why the government has created very detailed laws about how companies must deal with their hazardous waste.

## Assessment

1. Ask students to explain how activities above the ground can affect the water underground.
2. Have students tell you why hazardous waste is regulated.

## Enrichment

1. Draw a map of your community or region including all the waterways. Add a local source of potential hazardous waste pollution to the map and trace the path its waste would take if it were not regulated. (See the sidebar for examples of local hazardous waste generators.) Discuss how streams and creeks feed into larger bodies of water and how pollution at a small, local stream can result in pollution in rivers, lakes, bays, and/or oceans. This activity can be used to teach or review the concept of "bird's-eye" view, the different types of maps, and the use of legends and symbols.
2. Using papier maché or modeling clay and water-based paints, develop a relief map of the community or region including all waterways. To physically show how hazardous waste can travel through all waterways, put a few drops of food coloring on one end of the map. Tilt the structure, if necessary, and watch the food coloring travel.
3. Elicit what would happen to our waterways if they became contaminated by hazardous waste. How would people and ecosystems be affected?

### Examples of Local Hazardous Waste Generators

Dry cleaners
Print shops
Vehicle maintenance shops
Photoprocessing stores

Student Handout

# What's Going On Underground?